

Total Quality Management RHIC Retreat 2006

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Topics

- TQM Definition
- Operation strategy and competitive priorities
- Six Sigma
- An example application of the methodology
- Recommendations to decrease downtime
- Continuous Improvement

TQM Definition

- Elements of Total Quality Management (TQM)
 - **People Power**
 - Customer satisfaction
 - Employee involvement, empowerment & teamwork
 - **Process Power**
 - Well defined methods understood and respected by everyone
 - Using data to justify decisions
 - Continuous improvement

Competitive Priorities

- Every business must select a few of the following 9 competitive priorities with which to focus all decisions.

Category	Competitive Priority
Cost	1. Low-Cost Operations
Quality	2. Top Quality
	3. Consistent Quality
Time	4. Delivery Speed
	5. On-Time Delivery
	6. Development Speed
Flexibility	7. Customization
	8. Variety
	9. Volume Flexibility

C-A Competitive Priorities Focus For Operation Strategy

● Top Quality

- We must consistently and reliably produce high quality beam.
- Future goals are aggressive.

● Flexibility/Variety

- The C-A complex is designed for a wide variety of particle species, intensities, and energies. This will continue to be our forte.

● Development Speed

- Whether during shutdown or during operations, system development and modification speed is critical.

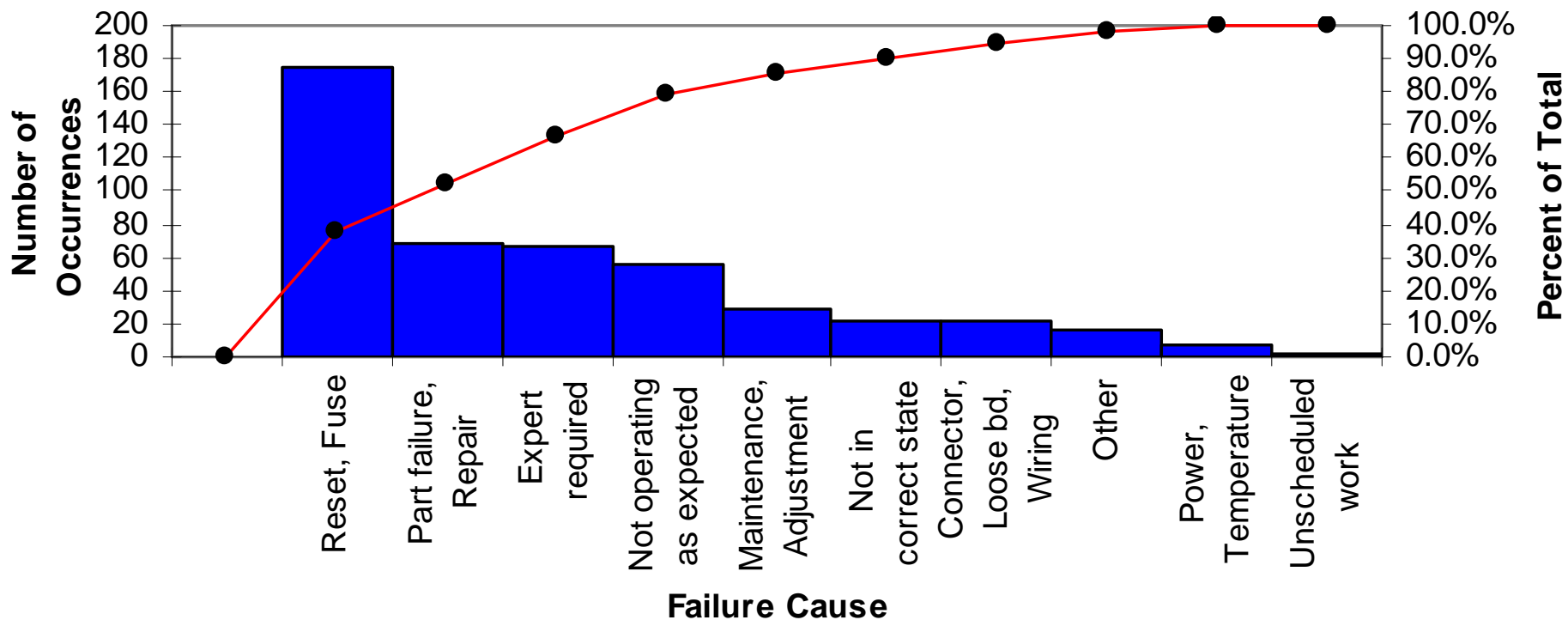
Six Sigma

- A TQM problem solving methodology

The DMAIC process

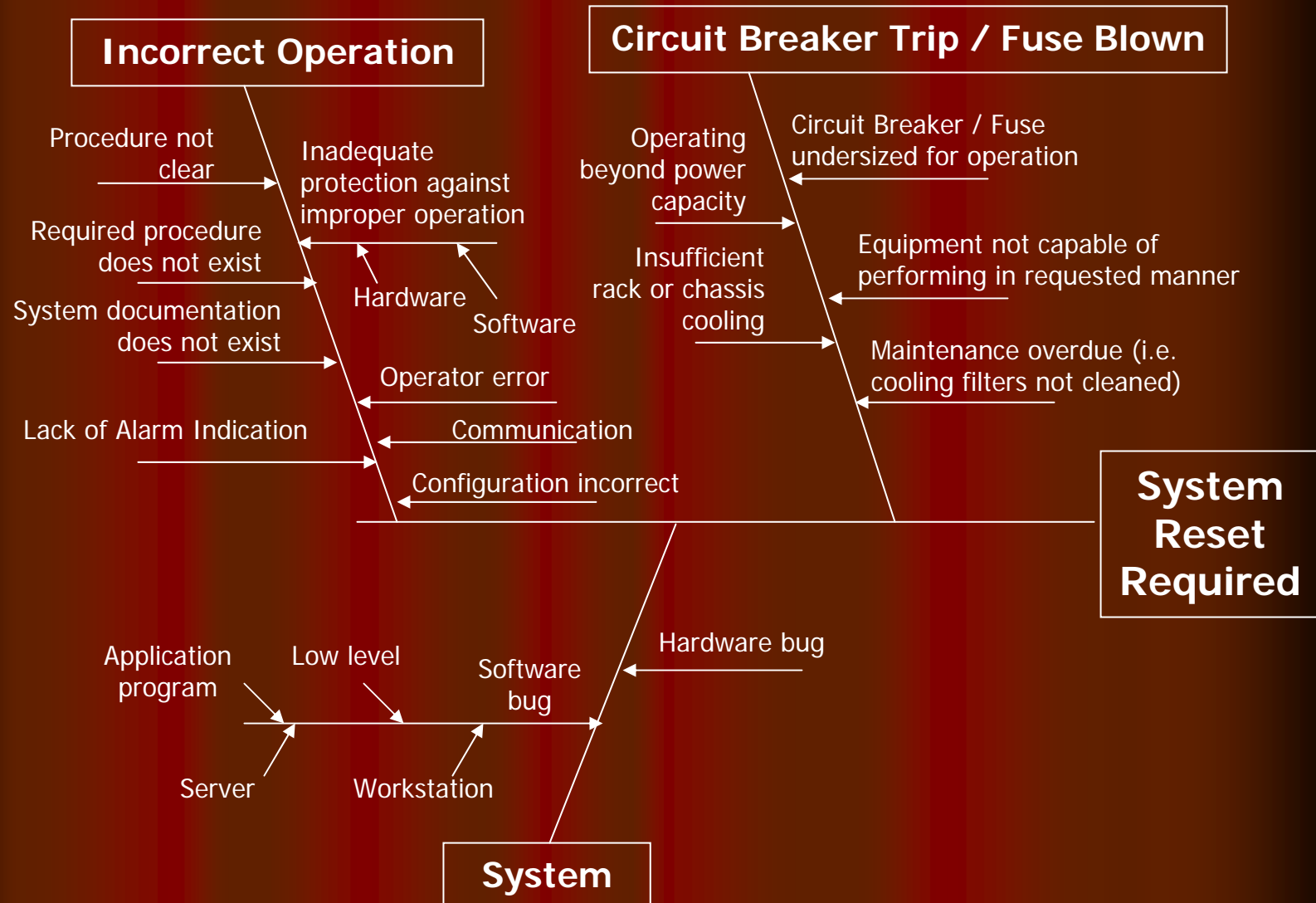
- Define
- Measure
- Analyze
- Improve
- Control

Pareto Chart of Failure Causes for Feb 2006 and March 2006



Description of Failure Cause	Feb-06	Mar-06	Total	Percent
System reset, fuse replacement required	81	94	175	37.8%
Part/Component failure, repair required	35	34	69	14.9%
System expert required	41	25	66	14.3%
System not operating as expected, unknown cause	32	24	56	12.1%
Maintenance Issue, hardware adjustment required	15	14	29	6.3%
System not in correct state/configuration	12	9	21	4.5%
Connector problem, loose board, wrong wiring etc.	13	8	21	4.5%
Other	11	6	17	3.7%
Facility power, Temperature	3	5	8	1.7%
Unscheduled new release or work performed	1	0	1	0.2%

Cause and Effect Diagram (fishbone)



Decrease Downtime

Use Online Analytical Processing (OLAP)

- Analysis using existing tools is not easy
 - Operations journal
 - Peter's charts
 - Trouble reports
 - Elogs
- Online failure analysis tools are required to allow selected data for display
 - system, accelerator, trends, selected time period, etc.

Decrease Downtime

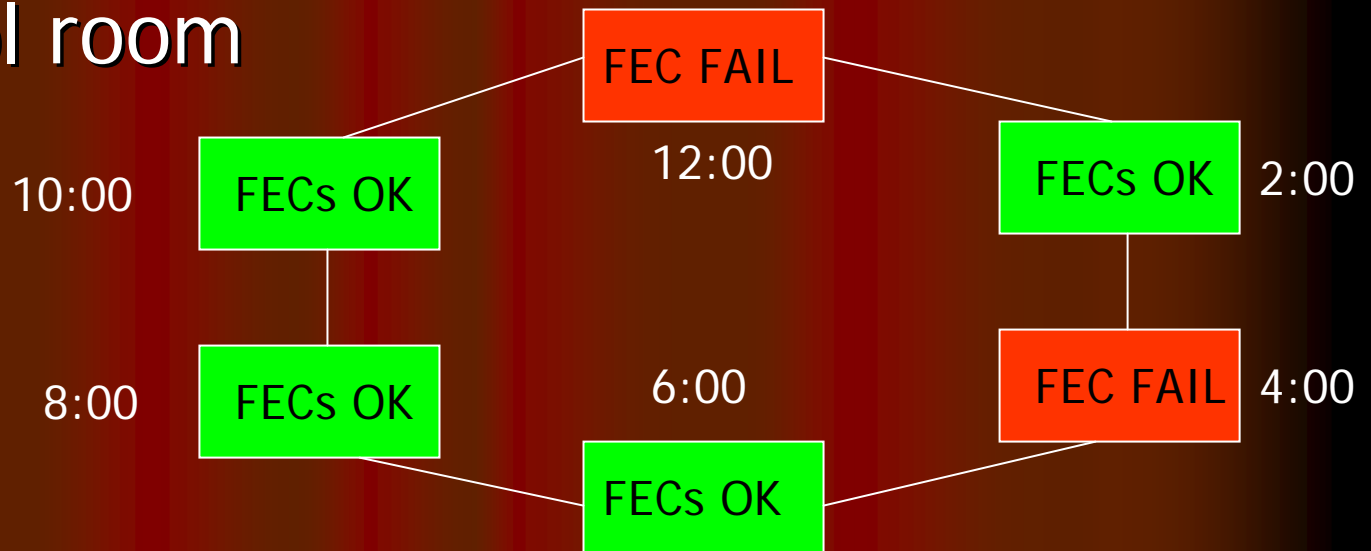
Improve Documentation

- Organize system documentation for easy web access
- Develop common format
 - Introduction, block diagram, purpose of system, system dependencies, how to configure, how to operate, troubleshooting, detailed test procedure, quick test procedure, etc.

Decrease Downtime

Enhance Alarm System

- Develop graphical representation of facility for system alarm notification
- Use large screens visible from entire control room



People Power & Process Power

Continuous Improvement

- Use the Poka-Yoke (mistake proofing) approach
- Ask everyone to recommend one or more process changes
- Increase standardization between groups
- Make sure everyone is enjoying their job
- Without passion, nothing is fun
- Involve more people in the exhilaration of machine operations

People Power & Process Power

Think Like a Consultant

- Understand the customer's needs
- Have a clear understanding of the deliverables, including documentation
 - Final payment won't be issued until the project is 100% complete
 - We seem to have many projects that are never fully completed
 - Keep a list of outstanding issues

During Presentations

- Please consider how we can improve one or more of our processes

Summary

- Understand our competitive priorities
 - Top quality, flexibility/variety, development speed
- Use the Six Sigma DMAIC method
- Continuously improve

Closing Quotes

- Quality is the result of People Power and Process Power
- Think how to improve every day
- Close enough isn't good enough
- The small stuff is the big stuff
- Quality should be measured by your worst day

Chowdhury, Subir. The Ice Cream Maker